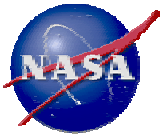


ISS Accommodations and Resource Availability

Pressurized Payload Interfaces

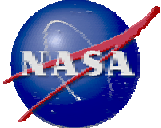
- International Standard Payload Racks (ISPRs)
 - 33 standard locations
 - 13 in U.S. Laboratory (USL) (one floor location contains 20" optical window)
 - 10 in Japanese Experiment Module (JEM) (plus one refrigerator/freezer location)
 - 10 in Columbus Orbiting Facility (COF)
- Additional Payload Racks/Support
 - 4 active payload racks in Centrifuge Accommodations Module (CAM)
 - 2.5 meter Centrifuge Rotor
 - 11.5 passive stowage racks (in Zarya, JEM Pressurized Section, CAM)



ISS Accommodations and Resource Availability

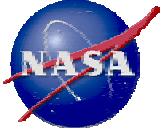
Pressurized Payload Interfaces, cont'd

- Transportation
 - Multi-Purpose Logistics Module (MPLM) contains 16 rack locations for ISPR transport (5 active locations, shared with crew, late and early access)
- Orbiter Middeck Payloads
 - power and thermal rejection capability increased to 2100 watts (was/is 400 W)
 - number of locations increased at bays 1, 2 and 3A (phased in)
 - late and early access for time critical samples



Standard ISPR Interfaces

Power	Prime Feed : 3.0 kW, 116 - 126 Vdc, 6 kW rated connector Auxiliary Feed : 1.2 kW, 116 - 126 Vdc, 6 kW rated connector
Data	Low rate : 1 Mbps, Mil-STD-1553B, 2 TSP, timing Medium rate : 10 Mbps, 802.3 Ethernet, 4 TSP High rate : 100 Mbps, fiber in, fiber out, to/from APS
Video	NTSC, EIA-RS-170A Standard, fibers or TSP, video in, video out, sync)
Thermal (moderate loop)	1/2" line in and out, 61°-73° F supply, 120° F max return, 121 psi max design pressure, delta inlet/outlet of 5.8 psi
Nitrogen	3/8" line in, 60°-113°F supply, 75-120 psi supply, max design pressure 200 psi, .2 lbm/min flow rate
Waste Gas	1" line, 60°-113° F temp range, 40 psi max pressure, reach 10 ⁻³ Torr in less than 2 hours, serial mode of operation
Fire/Maintenance Switch	Circuits for maintenance switch, fire indicator, fan speed, smoke detector
Mechanical	Connector location and clocking, seat tracks, pivot points, knee braces, static envelope

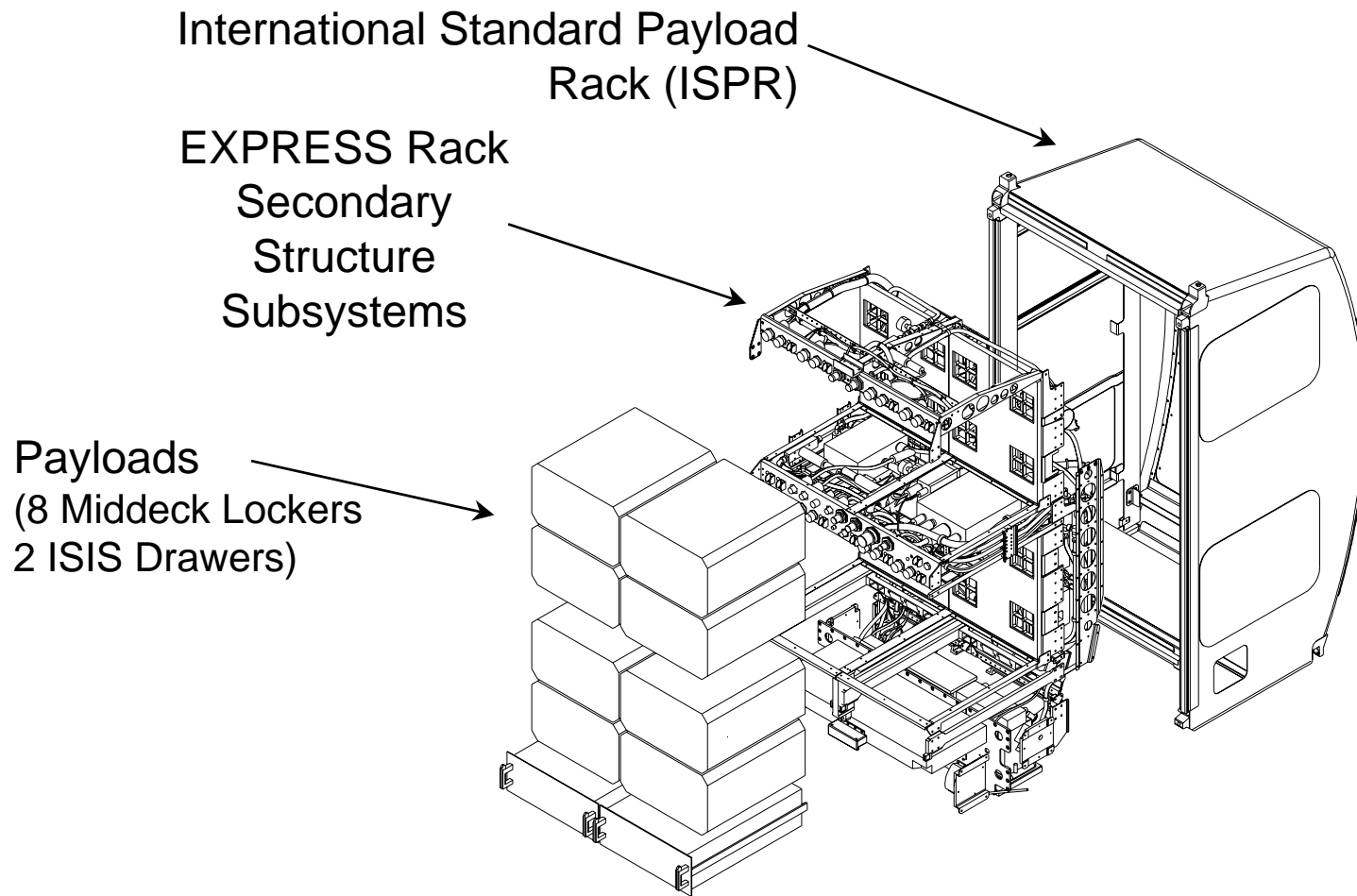


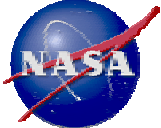
Optional ISPR Interfaces

Power	6.0 kW Feed : 116 - 126 Vdc, 5 in Lab, 4 in JEM, 5 in APM 12 kW Feeds : 116 - 126 Vdc, 3 in Lab, 2 with adjacent ISPRs
Thermal (Low Temp loop)	1/2" line in and out, 33°-50° F supply, 70° F max return, 121 psi max design pressure, delta inlet/outlet of 5.8 psi (13 in Lab, 4 in JEM)
Vacuum	1" line, reach 10^{-3} Torr (9 in Lab, 8 in APM, 6 in JEM)
Argon, Helium, CO2 (JEM only)	3/8" line in, 55°-113°F supply, 75-114 psi supply (6 with argon, 6 with helium, 4 with CO2)



EXPRESS Rack



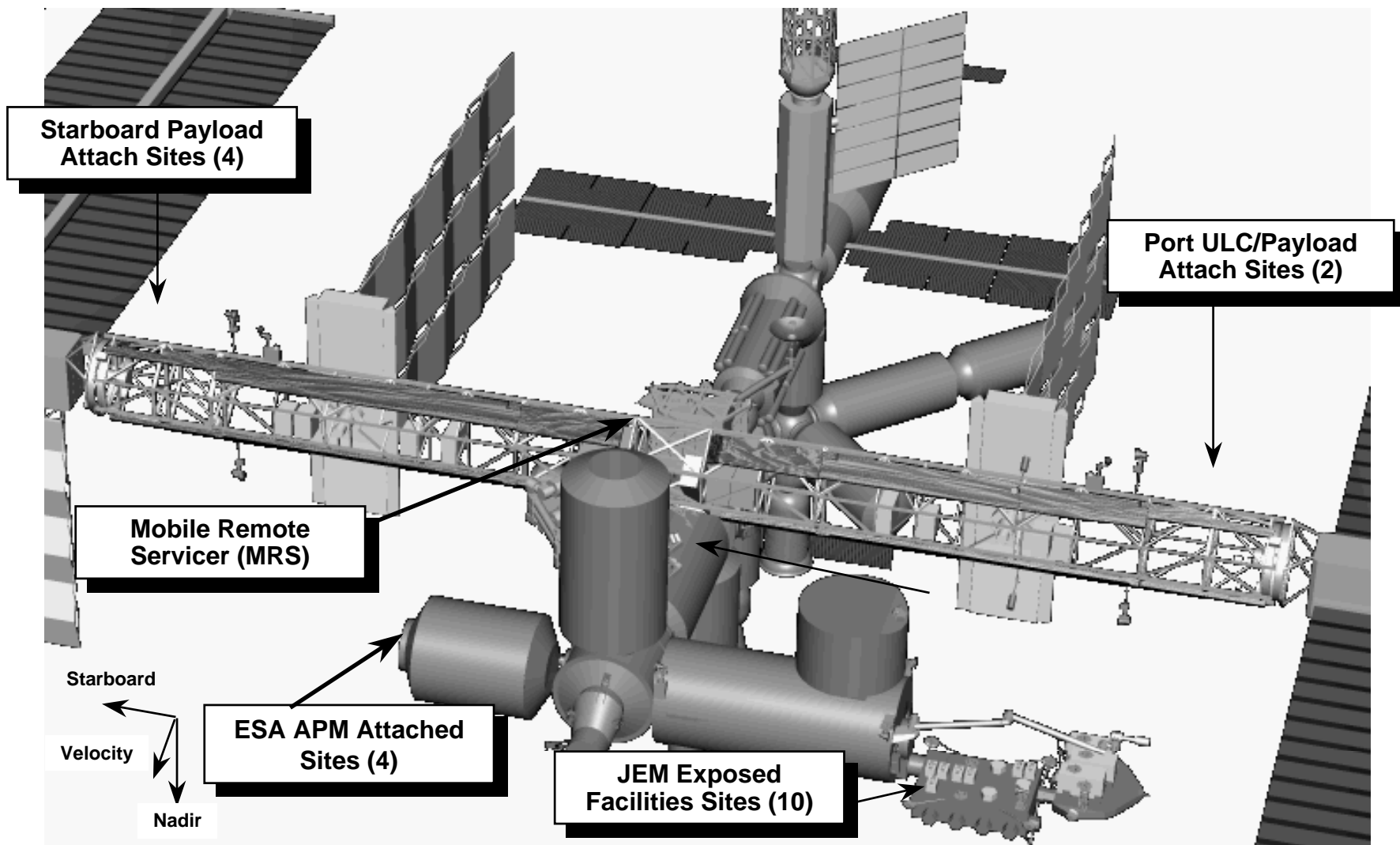


EXPRESS Rack Services

Type Accommodation	Amount per Payload Position	
	EXPRESS MDL	Shuttle MDL
Structural Attachment	72 lb @ +10in cg	69 lb @ +10in cg
Power	Up to 20 Amp (@ 28 Vdc)	Up to 20 Amp (@ 28 Vdc)
Thermal Control Air	Avionics Air ~ 15 scfm	18 or 36 scfm
Water	Up to 500 W	Not provided
Data	• 1- RS-422 • 2 - Analog • 1- Ethernet • 3 - Discrete (bi-direct.)	Not provided
Video	1 - NTSC/RS 170A feed from payload source	1 shared interface (via the VCU)
Vacuum Exhaust System	1 (Shared)	Not provided
Nitrogen	1 (Shared)	Not provided



ISS Unpressurized Accommodations





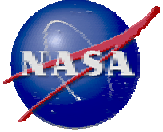
ISS Truss Attached Payloads

- Power and Data sources are routed to the P3 and S3 sites
 - Two 120 Vdc power feeds provided to attach sites (113 Vdc at site)
 - 25 amp circuit protection provided providing a maximum of 3 kW at each site
 - Power connection via the Umbilical Mechanism Assembly
 - Low rate command, control, and telemetry data provided via MIL-STD-1553 B protocol (<1 Mbps)
 - Each site provides 2 twisted shielded wire pairs (A & B)
 - 1553 data bus controller is the payload multiplexer/demultiplexers (MDMs) located in the US laboratory
 - Data is transferred to the payload MDM and downlinked via the KU Band link
 - High rate data link provided to each site (~43 Mbps to ground)
 - Fiber optic bi-directional high rate line
 - Data is down linked from the Automated Payload Switch to the KU Band link



EXPRESS Pallet

- The EXPRESS Pallet provides multiple payload users with a simple, standard interface to the exterior of ISS. Each Pallet provides up to 6 payloads with the resources given below
 - Power:
 - 120 Vdc at 2.5 kW per adapter
 - 3 kW total to pallet
 - 28 Vdc at 1 kW per adapter
 - Low rate data: command, control, and telemetry MIL-STD-1553B protocol, <1 Mbps, 2 twisted shielded wire pairs connected to Payload MDM (computer)
 - High rate data: 43 Mbps to ground via fiber optic link to Ku band communication system
 - Mass per pallet adapter: ~ 230 kg (500 pounds)
 - Volume envelope per adapter: ~ 1m x 1m x 1.25m high
 - Thermal control: passive



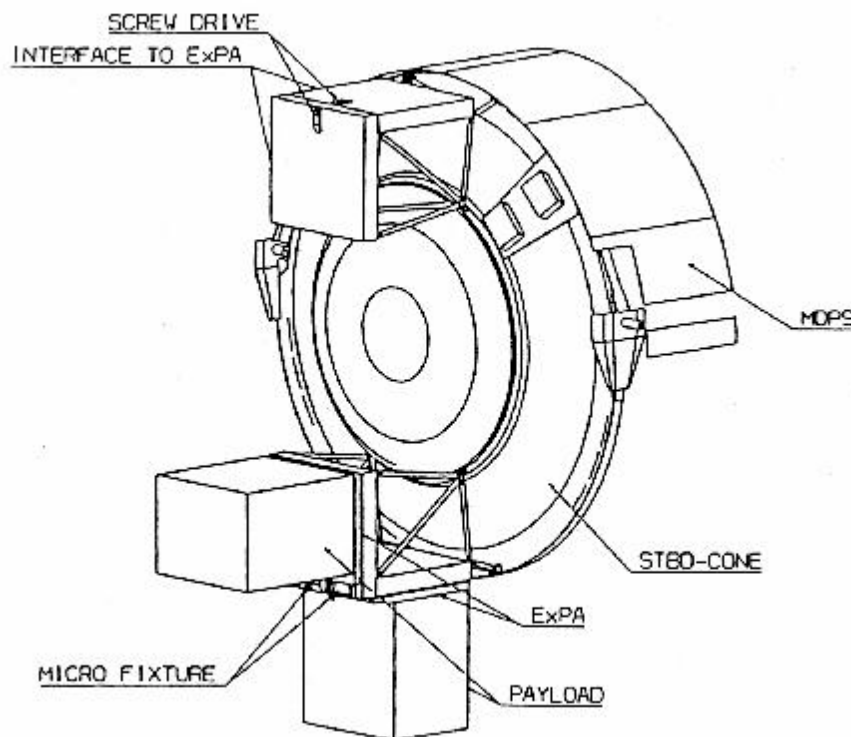
JEM-EF Accommodations

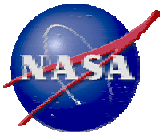
- 10 attachment sites - 5 are for U.S. payloads
 - Payload Volume - 6 x 2.6 x 3.3 ft (1.85 m x 1.0 m x 0.8 m)
 - Payload Weight - 1100 lbs (500 kg) maximum
 - 3 sites are able to accommodate 2500 kg
 - Power - 3 kW @ 113 VDC
 - Thermal Control - 3 kW cooling loop (61 to 75 degree F inlet, 122 degree F return) (16 to 24 degrees C inlet, 16 to 50 degrees C return)
 - 2 sites have 6 kW cooling
 - Command, Control, and Data - MIL-STD-1553 (~1Mbps)
 - Fields of view - nadir, zenith, 4 ram, 4 wake, 2 port
- Additional capabilities of some sites
 - 2 with 6 kW @ 113 VDC power
 - 8 with high rate data link (~40 Mbps)
 - 8 with NTSC video
 - 8 with Ethernet



ESA APM Attached Payload Interface

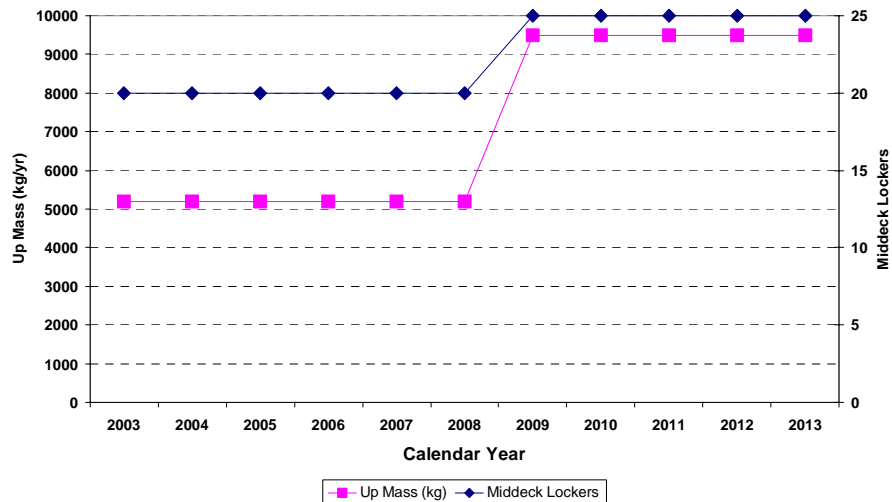
- Attached Payload interfaces are being added to the ESA APM
- Accommodations are being developed to support 4 Express Pallet Adapters



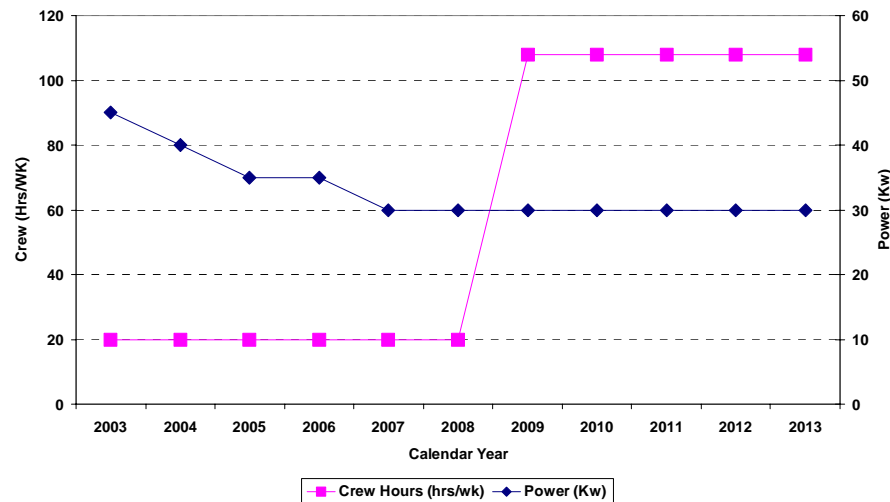


ISS Resource Availability Over Time

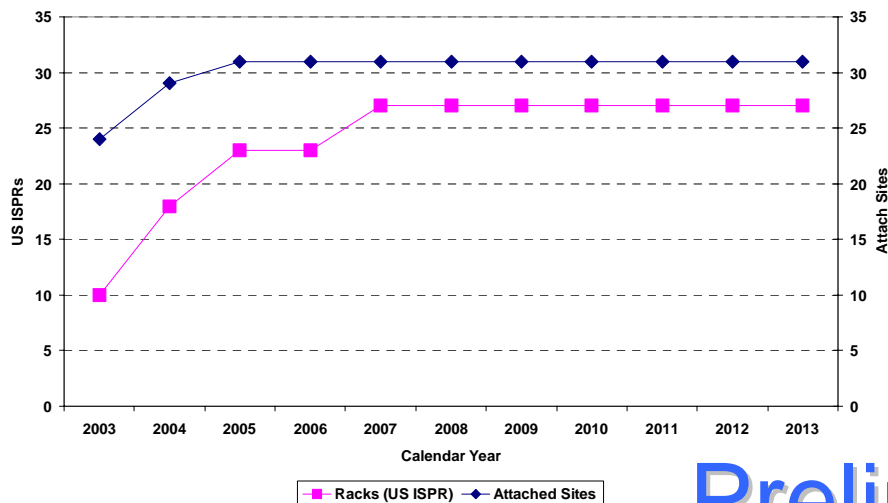
Up Mass and Middeck Lockers



Crew Hours and Power Availability



Attach Sites and ISPR Locations



Assumptions

1. All truss elements flown in 2003
2. JEM EF Launched in 2004
3. Columbus Launched in 2005
4. CAM launched in 2007
5. Crew of 3 through 2008, then crew of 6
6. Four flights per year 2003 - 2008 and five flights per year 2009 and subsequent
7. One MPLM flight per year through 2008 and two per year 2009 and subsequent (60 lbs/MDL + 4000 lbs/MPLM)

Preliminary